Biodiversity

- Variety of a all living things is biodiversity. Total number of species estimated, range from
- **7 to20 million.**
- Vast majority of species are concerned in **the tropical and subtropical regions.**
- Variation of life at all levels of biological organization with in a species, among species and ecosystems is called **biodiversity.**
- According to ecologists, totality of genes, species and ecosystems of a region is called biodiversity.
- Diversity of genes within a species is called -genetic diversity.
- **Genetic variations occur due to** genetic recombinations, gene or chromosomal mutations.
- Genetic diversity within a species increases with **environmental variability**
- Estimate of number of genes distributed across the world's flora & fauna is 10^{10} Diversity among species in an ecosystem is called **species diversity.**
- Examples of species diversity are **biodiversity hot spots.**
- Simplest measure of biodiversity is **Species richness.**
- Number of species per unit area is Species richness.
- **Species richness increases from** high latitudes to low latitudes.
- The peak of the species richness is not at equator but between 20° N and 30° N.
- The level of species richness increases rapidly from northern region towards equator but decreases slowly from the equator to southern region
- Relative abudance of the different species making up the richness ofthe area is called **species evenness**
- Variety of ecosystems on earth is called **ecosystem diversity**
- Diversity with in a particular area, community or ecosystem is called **alpha diversity**
- Number of taxa (species usually) present is an ecosystem is a measure of **alpha diversity** Species diversity between two ecosystems is **Beta diversity.**
- Comparing the number of taxa that are unique to each ofthe ecosystem is **Beta diversity.**

- Sorensen's similarity index is $\beta = 2C \quad /s1 + s2$
- where S_1 -total number of species in first community.
- S_2 = total number of species in second community.
- C = number of species common to both com munities.
- Measure of overall diversity for different eco systems within a region is **Gamma diversity.**
- The area that is uniform in environmental condi tions and in its distribution of animal and plant life is **biotope**
- An area constituting a natural ecological community with characteristic flora, fauna and environmental conditions and bounded by natural borders is called **ecoregion.**
- Largest biogeographic division ofthe earth's surface based on historic and evolutionary
- distribution patterns of plants and animals is called **ecozone/biogeographic realm.**
- Large areas ofthe earth's surface where plants and animals developed in relative isolation over long periods of time, and separated from one another by barriers like oceans, broad deserts or mountain ranges that prevent migration of animals is called **ecozone.**

- Unique species of a particular area are called **endemic species.**
- Sites of active speciation are areas rich in **endemic species.**
- Biodiversity is very low in **polar regions.**
- Biodiversity is distributed mostly in **tropics.**
- Biogeographic region that is both a significant reservoir of biodiversity and is threatened with destruction is **biodiveristy hot spot.**
- Biodiversity hot spots were originally identified **by Dr. Norman Myers.**
- Organisation that is focussed on biodiversity hot spot is **Conservation International (CI).**
- Biodiversity hot spots related to India are **Himalayan, Indo-Burma, Western ghats & SriLanka.**
- World wide Fund forNature (WWF) focussed over **200 ecoregions** for the conservation of biodiversity.

ROLE OF BIODIVERSITY

- As each species have a specific kind of function like capturing & storing energy, production anddecomposition of organic material, etc,
- Biodiversity has **an ecological role.** Fixing of atmospheric gases, regulation of climate are **ecological roles of biodiversity.**
- As biodiversity is a reservoir of resources for the manufacture of food, pharmaceuticals and cosmetics, it plays an **economic role.**
- Number of animals used as food **12**
- Number of crops cultivated for food supply **-15**
- 2/3 id of total food is supplied in the form **Wheat, Corn** & Rice.
- Medicine to treat malaria is extracted from the bark of **Cinchona** is **Quinine.**
- Drug useful to treat heart problems, **digitalin** is extracted from **Foxglove plant.** Pain relieving medicine **morphine** is exctracted from **Poppy plant.**
- Drugs obtained mostly from tropical rain forests are **anticancerous drugs.**
- Anticancerous drugs obtained from **Vinca** plant **Vinblastin & Vincristin.**
- Drug obtained from **Sarpagandha** is useful in the treatment of **hypertension.**
- Biodegradable pesticide extracted from **Chrysanthemum** is **Pyrethrin**
- Bacterium that is used as biopesticide **Bacillus turingiensis**
- Morethan 50% of biodiversity is harboured by **Tropical rain forests.** Biodiversity has ethical and scientific roles Homeostasis of ecosystem is maintained by biodiversity
- Biodiversity provides environmental services like water resources, soil pollution, pollution control

CAUSES OF EXTINCTION

- Main cause of species extinction in forests is **deforestation.**
- Reduction in regeneration of forests and low levels of biodiversity is due to **forest fires.** Endemic species may not survive due to introduction of non-native species. Endemic species of great African lakes Victoria, Malawi & Tanganyika are reduced due to the entry of the species **Nile perch.**
- Examples of exotic plant species responsible for the extinction of wild species are **Hyacinth, Lantana bushes, Eupatorium shrubs, Parthenium.**

- Exclusive Mauritius tree **Ciavaria major** became an endangered species due to the extinction of Rupltus cuculeatus *(Dodo)*
- Endemic species are protected from the invarion of other species by **natural barriers.**
- Highly fecund, ultra competetive, generalist species responsible for the loss of endemic species in an area are called **superspecies.**
- Amplification of pollutants in different trophic levels of a food dchain is called **biomagnification.**

CONSERVATION OF BIODIVERSITY

- The process of protecting an endangered species in its natural habitat is called **In-situ conservation/ On-site** conservation.
- Recovery of a population in the surrounding where they developed their distinct characters is possible by **In-situ** conservation.
- Development of a network of protected areas comes under **In-situ conservation**
- Natural habitats of certain endangered species, where no biotic interference is allowed are earmarked as National Parks.
- Earlier National Parks are Yellowstone **National Park-USA** & Royal **National Park- Australia.**
- The areas where only specific endangered fauna are protected and limited biotic interference is permitted Sanctuaries.
- The area where boundaries are not subscribed and private ownership of land is allowed are **Sanctuaries.**
- The area meant for conservation of biosphere reserves and for improvement of relationship between man & environment is termed as **biosphere Reserve.**
- The protected area for the whole ecosystem is **Biosphere Reserve.**
- The protected site for longterm scientific research & education is **Biosphere Reserve.**
- Functions of biosphere reserves are:

1) Conservation function
2) Development function
3) Logistic function

- Undisturbed & legally profeceted area of a biosphere reserve is Core zone.
- The zone that surrounds the core zone and accommodates resource management strategies, research, education is Buffer zone.
- Outer most part of biosphere reserve where sustainable resource management practices are promoted by cooperation between reserve management and local people is **Transition zone.**
- Undisturbed areas protected by local commu nities are **sacred forests/ lakes.**
- Conservation of genetic resources of species away from their area of origin or development is **calledex-situ conservation / off-site con servation.**
- Methods of ex-situ conservation are **off - site collection & gene banks.**
- Collection of wild and domesticated organisms in botanical gardens and zoos etc is called **off-site collection.**
- Types of genes banks:

1) Seed gene banks
2) Field gene banks

3) In-virto preservation

4) Cryopreservation

- Seeds which can tolerate upto 3% moistuure, anaerobic conditions, low temperature for prolonged periods are stored in **Orthodox seed banks Eg: Cereals, Legumes etc.**
- Maintaining recalcitrant plants in orchards is called **field gene banks.**
- Development of callus, embryoids, pollen grains, shoot tips for plants without visible seeds by using tissue culture methods in laboratories is called **in vitro preservation.**
- The method by which rapid multiplication of endangered species occurs is **in vitro preser vation.**
- The technique by which embryos, animal cells spermatozoa are preserved at -196°C is Cryopreservation.
- IUCN AND RED DATA BOOKS
- The international organization, founded in 1948 to encourage preservation of wild life, natural environment & living resources is **IUCN /** World conservation union
- "Red Data List" is maintained by **IUCN.**
- Red data list created in -1963
- The latest list created in **2006 - May 4**
- According to latest Red data list whole species evalutated are **-40,168**
- Additional sub species **-2,160**
- Critically endagerad+endangered+vulnerable species are called**-Threatend species**
- Number of threatened speceis **-16,118**
- Among them Animals **-7,725**, Plants-**8,390,** Lichens & mushrooms – **3**
- Number of categories given by IUCN Red List is -9
- If the last individual of a species is died it is termed as **extinct**
- Extinct species of Maritius - **Dodo**
- If a species is known to survive only in cultivation or in captivity, the category is **Extinct in the wild**
- When a species is facing an extremely high risk of extinction in the wild in immediate future, it is placed under **Critically endangered**
- Critically endangered species - **Podophyllum**
- **Berberis nilgiriensis** When a species is facing high risk of extinction in the wild in near future it belongs to the category **endangered**
- Endangered species - **Red panda**
- **Lion tailed macaque** When a taxon is not endangered but is facing a high risk of extinction in the wild in medium term future, it belongs to the category Vulnerable
- Vulnerable species - **Antelope cervicapra**
- When a taxon is not qualified for conservation dependent but closer to vulnerable are termed as **Near threatened**
- The taxon which do not quality for conserva tion dependent or near threatened is termed as **Least concerned**
- The taxon with inadequate information to make an assessment based on its distribution and population status is considered as **Data deficient**
- The taxon which is not yet been assessed against the criteria is termed **Not evaluated**

WILDLIFE IN INDIA

- **Biomes in India: (3)** Tropical humid forests/ Tropical dry/deciduous forests Warm deserts/ semi deserts.
- **Hot spots in India**: **(3)** Western Ghats/Sri Lanka Indo - Burma region (Covering Eastern Himalayas) Himalayan region.
- **Ecoregions in India: (10)** Trans-Himalayan, The Himalayan, The Indian desert Semi arid zones, Western ghats, Deccan peninsula, The Gangetic plain, North East India Islands & Coasts
- India is one of the centres of origin of cultivated plants out of 12
- World heritage sites in India (5)
- Khaziranga National Park-Assam.
- Manas National Park - Assam.
- Sunderbans National Park - West Bangal.
- Keoladeo Ghana National Park- Raj asthan
- Nanda Devi National Park - Uttarkhand.
- Number of Biosphere Reserves in India -14
- Number of Ramsar Wetlands-6
- Kolleru lake of A.P is considered **as Ramsar wetland**
- Number of National Parks in India-88
- Number of sanctuaries in India -490
- Biosphere Reserves of India that form **a part of** world network are:
  1) Nilgiri Biosphere Reserve
  2) Nanda Devi Biosphere Reserve
  3) Sunderbans Biosphere Reserve
  4) Gulfof Mannar Biosphere Reserve.
- 33% of endemic flora in India is concentrated mainly in North East region,Western ghats,
- North-West Himalayas,Andaman & Nicobar Islands
- 62% of endemic amphibian species are present in Western ghats.
- **50%** of the lizards in India are **endemic lizards** High degree of endemicity of lizards is seen in **Western ghats.**
- **India is homeland of** 167 cultivated species **and** 320 wild relatives of crop plants.
- The Act under which all the threatened species are protected is **Wildlife Protection Act 1972** Organisations which work together for conser vation of wildlife are **IBW & WWF.**
- Wildlife week is **First week of October.** Advisory body to Government of India is **Indian Board of Wildlife (IBW).**
- Acts related to wildlife conservation in India are
- The Indian Forest Act -1927
- The Wildlife (Protection)Act -1972
- The Forest Conservation Act-1980

- The Air Act-1980
- The Environment (Protection) Act -1986
- **India is a signatory to** Convention on International Trade in Endangered Species(CITES) in **1972** National Parks in India:
- First National Park of India - **Jim** Corbett **National Park**

- Jim Corbett National Park - Uttaranchal (Tigers are protected)
- Gir National Park - Gujarat (Lions are protected)
- Kaziranga National Park-Assam (One-horned Rhinoceros is Protected)
- Periyar National Park-Kerala (Tiger & Elephant reserve).
- Kanha National Park - Madhya Pradesh
- Sri Venkateswara National Park- Andhra Pradesh
- Kasu Brahmananda Reddy National Park Andhra Pradesh
- Mahavir Harina Vanasthali National Park Andhra Pradesh

Sanctuaries in India:

- Ranthambore Sanctuary -Raj asthan
- Mudumalai Sanctuary - Tamil Nadu
- Papikonda Sanctuary - Andhra Pradesh
- Eturunagaram Sanctuary - Andhra Pradesh
- Pulicat Sanctuary -Andhra Pradesh
- **Coringa Sanctuary - Andhra Pradesh**
- Protected areas near water bodies for migratory birds:
- Kolleru lake - Andhra Pradesh
- Ranganthittu Bird Sanctuary - Karnataka
- Bharathpur bird Sanctuary - Rajasthan [Keoladeo Ghana National Park]
- **Biosphere Reserves in India:** Nilgiri - Karnataka, Kerala & Tamilnadu
- Nanada Devi - Uttarakhand
- Sunderbans - West Bengal
- Gulf of Munnar - Tamil Nadu
- Manas - Assam
- Great Nicobar -Andaman & Nicobar Islands
- Thar Desert - Rajasthan
- Little Rann of Kutch - Gujarat
- **Special projects for endangered species: Project Tiger**
- **To preserve** *Panthera tigris tigris* Tiger reserves in India:
- Indravathi Tiger Reserve -Chattishgarh
- Nagarjuna Srisailam Tiger Reserve - A.P

Crocodile Breeding Project

- World's first captive breeding of crocodiles is started at Crocodile Breeding Project Tikerpada, Orissa Crocodiles protected in Crocodile breeding project, Tikerpada, Orissa are: **Crocodylusporosus-** Brackish water crocodile **Crocodylus palustrus** - Freshwater swamp crocodile
- **Gavialls gangeticiis** - River crocodile
- Snow leopard reserve of Himalayas is protecting the species **Uncia uncia** (Snow leopard)
- Project elephant is started to protect Asiatic elephant **Elephas maximus indicus**
- Elephants are protected in Periyar National Park-Kerala
- **Punthera leopersica** (Asiatic lion) is protected in Gir **National Park-Gujarath**

Organizations in India**:**

- Botanical Survey of India (BSI)
- Zoological Survey of India (ZSI)
- Bombay Natural History Society**(BNHS)**
- Wild life Protection Society of India Deharadun
- International Crops Research Institute for Semi Arid Tropics (ICRISAT), Hyderabad.
- Gennplasm of groundnuts, pigeon pea, chickpea, pearl millet & sorghum are conserved by **ICRISAT**

Endangered species **in India:**

- **Panthcra leo persica -** Asiatic lion
- **Antelope cervicapra** - Black buck (State animal of A. P.)
- **Ailurus ochraceus -** Red panda
- **Mucaca silenus** - Lion tailed macaque
- **Panthera tigris** - Tiger
- **Elephas maximus indicus -** Elephant
- **Cervus elaphus hanglu -** Kashmiri stag
- **Sus salvanius** - Pygmy hog
- **Grits leucogeranus** - Siberian crane
- Loris tardigradus - Slender loris